AMENDMENTS TO THE CLAIMS

Please correct a typographical error in claim 1 as shown. A complete listing of the claims follows.

1. (currently amended) A surface inspection apparatus suitable for use in detecting anomalies on different types of surfaces, said apparatus comprising:

a source supplying a first and ~~and~~ a second beam of radiation to a surface to be inspected, wherein the first beam is substantially normal to the surface and the second beam is at an oblique angle to the surface; and

optics comprising optical devices at different azimuthal angles about a line normal to the surface or about a direction corresponding thereto, the devices disposed so that radiation scattered by the surface at different azimuthal angles with respect to the line is directed to different devices without employing a common collecting instrument, and at least one collector substantially in a double dark field arrangement relative to the second beam and having an aperture larger than that of any one of the optical devices collecting radiation scattered by the surface.

2. (original) The apparatus of claim 1, said optics comprising a first set of optical devices receiving radiation scattered by the surface in directions near the line, and a second set of optical devices receiving radiation scattered by the surface at low elevation angles to the surface.

3. (original) The apparatus of claim 2, wherein the first set of optical devices comprises 6 to 10 optical devices forming substantially a ring around the line.

4. (original) The apparatus of claim 2, wherein the first set of optical devices receive radiation scattered by the surface at angles between 10 to 30 degrees from the line.

5. (original) The apparatus of claim 2, wherein the second set of devices collect radiation scattered by the surface at a low elevation angle of between 10 and 40 degrees to the surface.

6. (original) The apparatus of claim 2, further comprising a plurality of detectors converting the radiation scattered by the surface and reaching at least some of the devices and the at least one collector into respective signals representative of radiation scattered at different azimuthal angles about the line.

7. (original) The apparatus of claim 6, further comprising a processor determining the presence of anomalies in or on the surface from said signals.

8. – 9. (cancelled)

10. (original) The apparatus of claim 1, said optical devices comprising optical fibers, said fibers conveying radiation scattered by the surface and reaching at least some of the devices to the detectors.

11. (original) The apparatus of claim 10, wherein the optical fibers are multimode.

12. (original) The apparatus of claim 1, wherein the second beam illuminates a spot on the surface, and the aperture of the at least one collector subtends an angle of about 20 to 60 degrees at the spot.

13. (original) The apparatus of claim 1, wherein second beam illuminates a spot on the surface, and the aperture of at least one collector subtends an angle of about 40 to 60 degrees from the spot.

14. (original) The apparatus of claim 1, further comprising at least one polarizer in an optical path of the second beam, said polarizer interacting with the second beam before or after the surface interacts with the second beam.

15. (original) The apparatus of claim 14, said at least one polarizer polarizing radiation of the second beam before the beam reaches the surface.

16. (original) The apparatus of claim 15, wherein said at least one polarizer passes P-polarized or circularized polarized radiation, and the at least one collector collects unpolarized radiation scattered by the surface.

17. (previously presented) The apparatus of claim 15, wherein said at least one polarizer passes S- polarized radiation, said apparatus further comprising another polarizer that passes S- polarized radiation and that is located in an optical path of radiation scattered by the surface and collected by the at least one collector.

18. (original) The apparatus of claim 1, said source comprising at least two optical fibers supplying the first and second beams.

19. (original) The apparatus of claim 18, said source further comprising one or more radiation emitting elements supplying the first and second beams.

20. (original) The apparatus of claim 18, said fibers being single-mode fibers.

21. (original) The apparatus of claim 1, said optical devices comprising optical fibers, each of said fibers including a core and cladding, said cladding separating a collection aperture of each fiber from adjacent fiber(s).

22. (original) The apparatus of claim 21, said optical devices further comprising external coatings over the cladding.

23. (original) The apparatus of claim 1, said optical devices disposed symmetrically about the line or the direction.

24. (original) The apparatus of claim 1, said optical devices disposed at elevation angles away from expected components scattered by the pattern.

25. (original) The apparatus of claim 24, wherein said expected components scattered by the pattern are Fourier components.

26. (original) The apparatus of claim 1, wherein said optical devices are substantially at elevation angles between about 5 and 20 degrees from the line or the direction.

27. (original) The apparatus of claim 1, said optics comprising two lenses, wherein apertures of the two lenses are substantially centered at +90 and –90 degrees azimuthal angles relative to a plane of incidence of the second beam.

28. (original) The apparatus of claim 1, said apparatus comprising a compact optical head.

29. (original) The apparatus of claim 1, wherein the compact optical head has dimensions that do not exceed about 5 cm.

30. (previously presented) The apparatus of claim 1, wherein the at least one collector comprises at least one objective focusing radiation scattered by the surface to a detector.

31. (previously presented) The apparatus of claim 1, wherein the at least one collector comprises a plurality of optical fibers collecting radiation scattered by the surface.

32. (original) A method for detecting anomalies on different types of surfaces by means of an apparatus, said apparatus comprising:

a source for a first and a second beam of radiation to a surface to be inspected, wherein the first beam is substantially normal to the surface and the second beam is at an oblique angle to the surface; and

optics comprising optical devices at different azimuthal angles about a line normal to the surface or about a direction corresponding thereto, the devices disposed so that radiation scattered by the surface at different azimuthal angles with respect to the line is directed to

different devices, and at least one collector having an aperture larger than that of any one of the optical devices and substantially in a double dark field arrangement relative to the second beam collecting and focusing radiation scattered by the surface; said method comprising:

(a) causing the source to supply the first and second beam to the surface and causing the surface to be scanned by the beam;

(b) directing radiation scattered by the surface to the optical devices without employing a common collecting instrument;

(c) detecting radiation scattered by the surface and collected by the devices and/or the at least one collector; and

(d) determining from the detected radiation anomalies on different types of surfaces.

33. (original) The method of claim 32, wherein said determining determines from the detected radiation anomalies on unpatterned and patterned wafers.

34. (original) The method of claim 32, wherein said determining determines from the detected radiation anomalies on unpatterned or patterned wafers, and wafer surfaces after chemical and mechanical polishing.

35. (original) The method of claim 32, wherein the causing causes the second beam to be supplied to the surface, and the detecting detects radiation scattered by the surface and collected by the at least one collector.

36. (original) The method of claim 35, wherein the causing causes the second beam to be polarized.

37. (original) The method of claim 36, wherein the second beam is caused to be P-polarized and the detecting detects unpolarized radiation for detecting anomalies on smooth surfaces.

38. (original) The method of claim 36, wherein the second beam is caused to be circularly polarized and the detecting detects unpolarized radiation for detecting anomalies on surfaces of dielectric layers.

39. (original) The method of claim 36, wherein the second beam is caused to be S-polarized and the detecting detects S-polarized radiation for detecting anomalies on rough surfaces.

40. (original) The method of claim 35, further comprising:

(e) causing the source to supply the first beam to the surface;

(f) detecting radiation scattered by the surface and collected by the optical devices; and

(g) determining from the detected radiation micro-scratches on different types of surfaces.

41. (original) The method of claim 40, said optics comprising a first set of optical devices receiving radiation scattered by the surface in directions near the line or the direction, and a second set of optical devices receiving radiation scattered by the surface at low elevation angles to the surface, wherein the detecting in (f) detects radiation scattered by the surface and collected by the first set of optical devices, and wherein said determining comprises comparing signals or pairs of signals converted from radiation received by some of the optical devices in the first set located substantially on opposite sides of the line.

42. (original) The method of claim 41, wherein the detecting in (b) detects radiation scattered by the surface and collected by the second set of optical devices, and wherein said determining in (d) determines from the detected radiation anomalies on patterned or unpatterned surfaces.

43. (original) The method of claim 32, wherein the causing causes the second beam to be supplied to the surface, and the detecting detects radiation scattered by the surface and collected by the optical devices.

44. (original) The method of claim 43, wherein the detecting detects by means of detectors, and the determining determines anomalies without using output signals of detectors that are saturated.

45. (previously presented) The method of claim 43, wherein the detecting comprises sampling outputs of the detectors, and the determining determines anomalies on the surface from minimum or median values of the detector output samples.

46. (original) The method of claim 43, wherein the detecting detects by means of detectors that provide output signals, and the detecting comprises sampling the output signals, and the determining determines anomalies on the surface from minimum or median values of the detector output samples.

47. (original) The method of claim 43, wherein the surface is unpatterned, further comprising selecting from the optical devices only those optical devices that collect radiation scattered by the surface within a predetermined azimuthal collection angle and wherein said detecting in (c) detects only the radiation scattered by the surface and collected by the selected optical devices.

48. (previously presented) A surface inspection apparatus suitable for use in detecting anomalies on different types of surfaces, said apparatus comprising:

a source supplying a first or a second beam of radiation to a surface to be inspected, wherein the first beam is substantially normal to the surface and the second beam is at an oblique angle to the surface; and

optics comprising optical devices at different azimuthal angles about a line normal to the surface or about a direction corresponding thereto, the devices disposed so that radiation scattered by the surface at different azimuthal angles with respect to the line is directed to different devices without employing a common collecting instrument, and at least one collector substantially in a double dark field arrangement relative to the second beam and having an aperture larger than that of any one of the optical devices collecting radiation scattered by the surface.

49. (previously presented) The apparatus of claim 48, said optics comprising a first set of optical devices receiving radiation scattered by the surface in directions near the line, and a second set of optical devices receiving radiation scattered by the surface at low elevation angles to the surface.

50. (previously presented) The apparatus of claim 49, wherein the first set of optical devices comprises 6 to 10 optical devices forming substantially a ring around the line.

51. (previously presented) The apparatus of claim 49, wherein the first set of optical devices receive radiation scattered by the surface at angles between 10 to 30 degrees from the line.

52. (previously presented) The apparatus of claim 49, wherein the second set of devices collect radiation scattered by the surface at a low elevation angle of between 10 and 40 degrees to the surface.

53. (previously presented) The apparatus of claim 49, further comprising a plurality of detectors converting the radiation scattered by the surface and reaching at least some of the devices and the at least one collector into respective signals representative of radiation scattered at different azimuthal angles about the line.

54. (previously presented) The apparatus of claim 53, further comprising a processor determining the presence of anomalies in or on the surface from said signals.

55. (previously presented) The apparatus of claim 54, the source supplying the first beam and not the second beam of radiation to the surface, wherein the processor processes signals converted from radiation received by the first set of optical devices to determine the presence of defects on a semiconductor wafer surface after it has been chemically and mechanically polished.

56. (previously presented) The apparatus of claim 55, wherein the processor compares signals or pairs of signals converted from radiation received by some of the optical devices in the first set located substantially on opposite sides of the line, to determine the presence of micro-scratches on the semiconductor wafer surface after it has been chemically and mechanically polished.

57. (previously presented) The apparatus of claim 48, said optical devices comprising optical fibers, said fibers conveying radiation scattered by the surface and reaching at least some of the devices to the detectors.

58. (previously presented) The apparatus of claim 57, wherein the optical fibers are multimode.

59. (previously presented) The apparatus of claim 48, wherein the second beam illuminates a spot on the surface, and the aperture of the at least one collector subtends an angle of about 20 to 60 degrees at the spot.

60. (previously presented) The apparatus of claim 48, wherein second beam illuminates a spot on the surface, and the aperture of at least one collector subtends an angle of about 40 to 60 degrees from the spot.

61. (previously presented) The apparatus of claim 48, further comprising at least one polarizer in an optical path of the second beam, said polarizer interacting with the second beam before or after the surface interacts with the second beam.

62. (previously presented) The apparatus of claim 61, said at least one polarizer polarizing radiation of the second beam before the beam reaches the surface.

63. (previously presented) The apparatus of claim 62, wherein said at least one polarizer passes P- polarized or circularized polarized radiation, and the at least one collector collects unpolarized radiation scattered by the surface.

64. (previously presented) The apparatus of claim 62, wherein said at least one polarizer passes S- polarized radiation, said apparatus further comprising another polarizer that passes S- polarized radiation and that is located in an optical path of radiation scattered by the surface and collected by the at least one collector.

65. (previously presented) The apparatus of claim 48, said source comprising at least two optical fibers supplying the first and second beams.

66. (previously presented) The apparatus of claim 65, said source further comprising one or more radiation emitting elements supplying the first and second beams.

67. (previously presented) The apparatus of claim 65, said fibers being single-mode fibers.

68. (previously presented) The apparatus of claim 48, said optical devices comprising optical fibers, each of said fibers including a core and cladding, said cladding separating a collection aperture of each fiber from adjacent fiber(s).

69. (previously presented) The apparatus of claim 68, said optical devices further comprising external coatings over the cladding.

70. (previously presented) The apparatus of claim 48, said optical devices disposed symmetrically about the line or the direction.

71. (previously presented) The apparatus of claim 48, said optical devices disposed at elevation angles away from expected components scattered by the pattern.

72. (previously presented) The apparatus of claim 71, wherein said expected components scattered by the pattern are Fourier components.

73. (previously presented) The apparatus of claim 48, wherein said optical devices are substantially at elevation angles between about 5 and 20 degrees from the line or the direction.

74. (previously presented) The apparatus of claim 48, said optics comprising two lenses, wherein apertures of the two lenses are substantially centered at +90 and –90 degrees azimuthal angles relative to a plane of incidence of the second beam.

75. (previously presented) The apparatus of claim 48, said apparatus comprising a compact optical head.

76. (previously presented) The apparatus of claim 48, wherein the compact optical head has dimensions that do not exceed about 5 cm.

77. (previously presented) The apparatus of claim 48, wherein the at least one collector comprises at least one objective focusing radiation scattered by the surface to a detector.

78. (previously presented) The apparatus of claim 48, wherein the at least one collector comprises a plurality of optical fibers collecting radiation scattered by the surface.

79. (previously presented) A method for detecting anomalies on different types of surfaces by means of an apparatus, said apparatus comprising:

a source for a first or a second beam of radiation to a surface to be inspected, wherein the first beam is substantially normal to the surface and the second beam is at an oblique angle to the surface; and

optics comprising optical devices at different azimuthal angles about a line normal to the surface or about a direction corresponding thereto, the devices disposed so that radiation scattered by the surface at different azimuthal angles with respect to the line is directed to different devices, and at least one collector having an aperture larger than that of any one of the

optical devices and substantially in a double dark field arrangement relative to the second beam collecting and focusing radiation scattered by the surface; said method comprising:

(a) causing the source to supply the first or second beam to the surface and causing the surface to be scanned by the beam;

(b) directing radiation scattered by the surface to the optical devices without employing a common collecting instrument;

(c) detecting radiation scattered by the surface and collected by the devices and/or the at least one collector; and

(d) determining from the detected radiation anomalies on different types of surfaces.

80. (previously presented) The method of claim 79, wherein said determining determines from the detected radiation anomalies on unpatterned and patterned wafers.

81. (previously presented) The method of claim 79, wherein said determining determines from the detected radiation anomalies on unpatterned or patterned wafers, and wafer surfaces after chemical and mechanical polishing.

82. (previously presented) The method of claim 79, wherein the causing causes the second beam to be supplied to the surface, and the detecting detects radiation scattered by the surface and collected by the at least one collector.

83. (previously presented) The method of claim 82, wherein the causing causes the second beam to be polarized.

84. (previously presented) The method of claim 83, wherein the second beam is caused to be P-polarized and the detecting detects unpolarized radiation for detecting anomalies on smooth surfaces.

85. (previously presented) The method of claim 83, wherein the second beam is caused to be circularly polarized and the detecting detects unpolarized radiation for detecting anomalies on surfaces of dielectric layers.

86. (previously presented) The method of claim 83, wherein the second beam is caused to be S-polarized and the detecting detects S-polarized radiation for detecting anomalies on rough surfaces.

87. (previously presented) The method of claim 82, further comprising:

(e) causing the source to supply the first beam to the surface;

(f) detecting radiation scattered by the surface and collected by the optical devices; and

(g) determining from the detected radiation micro-scratches on different types of surfaces.

88. (previously presented) The method of claim 87, said optics comprising a first set of optical devices receiving radiation scattered by the surface in directions near the line or the direction, and a second set of optical devices receiving radiation scattered by the surface at low elevation angles to the surface, wherein the detecting in (f) detects radiation scattered by the surface and collected by the first set of optical devices, and wherein said determining comprises comparing signals or pairs of signals converted from radiation received by some of the optical devices in the first set located substantially on opposite sides of the line.

89. (previously presented) The method of claim 88, wherein the detecting in (b) detects radiation scattered by the surface and collected by the second set of optical devices, and wherein said determining in (d) determines from the detected radiation anomalies on patterned or unpatterned surfaces.

90. (previously presented) The method of claim 79, wherein the causing causes the second beam to be supplied to the surface, and the detecting detects radiation scattered by the surface and collected by the optical devices.

91. (previously presented) The method of claim 90, wherein the detecting detects by means of detectors, and the determining determines anomalies without using output signals of detectors that are saturated.

92. (previously presented) The method of claim 90, wherein the detecting comprises sampling outputs of the detectors, and the determining determines anomalies on the surface from minimum or median values of the detector output samples.

93. (previously presented) The method of claim 90, wherein the detecting detects by means of detectors that provide output signals, and the detecting comprises sampling the output signals, and the determining determines anomalies on the surface from minimum or median values of the detector output samples.

94. (previously presented) The method of claim 90, wherein the surface is unpatterned, further comprising selecting from the optical devices only those optical devices that collect radiation scattered by the surface within a predetermined azimuthal collection angle and wherein said detecting in (c) detects only the radiation scattered by the surface and collected by the selected optical devices.